

Last Revised: January 2000

Summary Status

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Landings Data

## **Witch Flounder**

by

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The witch flounder or grey sole, *Glyptocephalus cynoglossus*, is common throughout the Gulf of Maine and also occurs in deeper areas on Georges Bank and along the shelf edge as far south as Cape Hatteras. Research vessel survey data suggest that the Gulf of Maine-Georges Bank population may be relatively discrete from populations in other areas. Witch flounder appear to be sedentary, preferring moderately deep areas; few fish are taken shallower than 27 m (15 fathoms) and most are caught between 110 and 275 m (60 and 150 fathoms). Spawning occurs in late spring and summer. Witch flounder attain lengths up to 78 cm (31 in.) and weights of approximately 2 kg (4.5 lb).

The principal fishing gear used to catch witch flounder is the otter trawl. Recreational catches are insignificant. The U.S. fishery is managed under the New England Fishery Management Council's Northeast Multispecies Fishery Management Plan (FMP). Under this FMP witch flounder are included in a complex of 15 groundfish species which has been managed by time/area closures, gear restrictions, minimum size limits, and, since 1994, direct effort controls including a moratorium on permits and days-at-sea restrictions under Amendments 5 and 7 to the FMP. Amendment 9 established biomass rebuilding targets, and defines control rules which specify target fishing mortality rates and corresponding rebuilding time horizons. The goal of the management program is to reduce fishing mortality to levels which will allow stocks within the complex to initially rebuild above minimum biomass thresholds, and, ultimately, to remain at or near target biomass levels.

Historically, significant proportions of the U.S. nominal catch have been taken both on Georges Bank and in the Gulf of Maine; but in recent years most of the U.S. catch has come from the Gulf of Maine area. Canadian landings from both areas have been minor (never more than 68 mt annually). Distant-water fleet catches averaged 2,700 mt in 1971-1972, but subsequently declined sharply and have been negligible since 1976. Total landings peaked at more than 6,000 mt in 1971, declined to an annual average of 2,800 mt during 1973-1981, and then increased sharply to 6,700 mt in 1984. Landings then declined steadily to only 1,500 mt in 1990, the lowest value since 1964. Landings during 1991-1998 averaged 2,200 mt annually. Total landings in 1998 were 1,800 mt.

The NEFSC autumn bottom trawl survey biomass index declined from an average of 3.6 kg per

tow in 1966-1970 to 0.9 kg per tow in 1976 following heavy exploitation by distant-water fleets. The index increased in 1977-78 but then declined to 0.2 kg per tow in 1992, the lowest level on record. The index increased slightly to 1.0 kg per tow in 1996, but subsequently declined to 0.4 kg per tow in 1998.

Prior to the 1980s, witch flounder was primarily a bycatch species. In the early 1980s, U.S. commercial landings per unit effort indices for witch flounder increased and peaked in 1983 as effort became more directed toward witch flounder. As abundance declined, catch rates also declined to a record low in 1990. Recent indices have increased slightly, but remain below the time series average.

Between 1982 and 1998, 7.3 million witch flounder were discarded in the northern shrimp fishery and large-mesh otter trawl fisheries. Discards in the northern shrimp fishery consist primarily of ages 1 to 4 witch flounder, while discards in the large mesh otter trawl fishery are largely composed of fish age 3 and older. Almost all age 6 and older fish are landed.

Virtual population analyses indicate that fishing mortality on fully-recruited ages (7 to 9+) increased from  $F=0.21$  (18% exploitation rate) in 1982 to  $F=0.59$  (42% exploitation rate) in 1985 and then declined to only 0.24 (20% exploitation rate) in 1990. Fishing mortality then increased to 0.86 (54% exploitation rate) in 1996 and then dropped to  $F=0.37$  (29% exploitation rate) in 1998. Total biomass (age 3+) declined steadily from 28,000 mt in 1982 to 7,700 mt in 1994 and then rose sharply to 18,900 mt in 1998. Spawning stock biomass doubled from a record-low level of 4,200 mt in 1995 to 8,700 mt in 1998, but remains well below historically high levels as evidenced by extrapolations from the NEFSC research vessel survey time series. Recruitment has been above average since 1992.

Since the mid-1980s, the age structure of the stock has become severely truncated. The NEFSC 1980 autumn survey indicated that 34% of the witch flounder population was age 11 or older; for 1984, this figure had declined to 14%, and since 1995, less than 1% of the population has been 11 years or older. This trend is also reflected in the commercial landings; 16% of witch flounder in 1984 landings were age 11 or older, and by 1998, this figure had dropped to 2%.

The estimates of age 3+ biomass (18,900 mt) and  $F$  on 3+ biomass (0.13) from the most recent assessment indicate that the witch flounder stock was not overfished in 1998, although overfishing was occurring. Assuming 1999 catches equal 1998 catches, the 1999 stock biomass is estimated to be 26,000 mt, which is above  $B_{MSY}$ . The 1999 fishing mortality rate is projected to decline to  $F=0.096$ , which is below the overfishing threshold,  $F_{MSY}=0.106$ . Therefore, by the Amendment 9 control rule, overfishing is not expected to have occurred in 1999. The stock has been rapidly rebuilding due to above average recruitment from 1993 onward.

### **For further information**

Burnett, J., M. R. Ross, and S. H. Clark. 1992. Several biological aspects of the witch flounder (*Glyptocephalus cynoglossus* (L.)) in the Gulf of Maine-Georges Bank region. J. Northw. Atl. Fish. Sci. 12:15-25.

NEFSC [Northeast Fisheries Science Center]. 1999. [Report of the] 29th Northeast Regional Stock Assessment Workshop (29th SAW) Stock Assessment Review Committee (SARC) consensus summary of assessments. Northeast Fish. Sci. Cent. Ref. Doc. 99-14. 347 p.

Wigley, S. E., S.X. Cadrin, and J.K.T. Brodziak. 1999. Assessment of the witch flounder stock in Subareas 5 and 6 for 1999. Northeast Fish. Sci. Cent. Ref. Doc. 99-16. 153 p.

### Summary Status

Long-term potential catch (MSY)	=	2,684 mt
Biomass corresponding to MSY	=	$B_{MSY} = 25,000$ mt
Minimum biomass threshold <sup>1</sup>	=	13,200 mt
Stock biomass in 1999 <sup>2</sup>	=	26,000 mt (Implies stock was not overfished)
$F_{MSY}$ <sup>1</sup>	=	0.106
$F_{TARGET}$ <sup>1, 3</sup>	=	0.09
$F_{TARGET99}$ <sup>1</sup>	=	0.09
Overfishing definition	=	$F_{THRESHOLD99}^{1, 4} = 0.106$
$F_{1999}$ <sup>1, 2</sup>	=	0.096 (Implies overfishing was not occurring)
Age at 50% maturity	=	3.6 years, males 4.4 years, females
Size at 50% maturity	=	25.3 cm (10 in.), males 30.4 cm (12 in.), females
Assessment level	=	Age structured
Management	=	Northeast Multispecies FMP

$$M = 0.15$$

$$F_{0.1} = 0.16$$

$$F_{MAX} = 0.35$$

<sup>1</sup> Weighted by stock biomass at age.

<sup>2</sup> Based on projected catch statistics.

<sup>3</sup> At  $B_{MSY}$ , the lower 80<sup>th</sup> percentile (or 10<sup>th</sup> percentile) of  $F_{MSY}$  estimate.

<sup>4</sup>  $F_{THRESHOLD} = F_{MSY} = 0.106$  on biomass when biomass exceeds  $B_{MSY}$ . When biomass is between  $B_{MSY}$  and the minimum biomass threshold,  $F_{THRESHOLD}$  is the maximum  $F$  that allows rebuilding to  $B_{MSY}$  in 5 years. When biomass is below the minimum biomass threshold,  $F_{THRESHOLD} = 0$ .

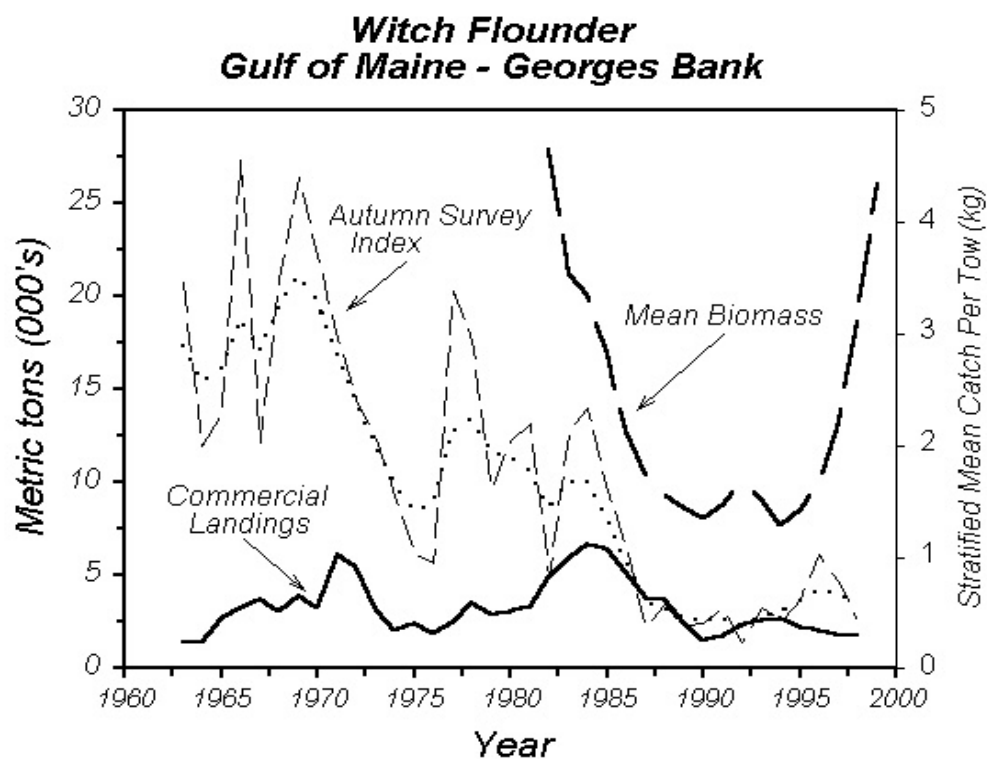


Table 10.1 Recreational and commercial landings (thousand metric tons)

Category	Year										
	1979-88 Average	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
U.S. recreational	-	-	-	-	-	-	-	-	-	-	-
Commercial											
United States	4.4	2.1	1.5	1.8	2.2	2.6	2.7	2.2	2.1	1.8	1.8
Canada	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other	<0.1	-	-	-	-	-	-	-	-	-	-
Total nominal catch	4.4	2.1	1.5	1.8	2.2	2.6	2.7	2.2	2.1	1.8	1.8